Performance & Benefits Assessment of the Precision Electric Turret

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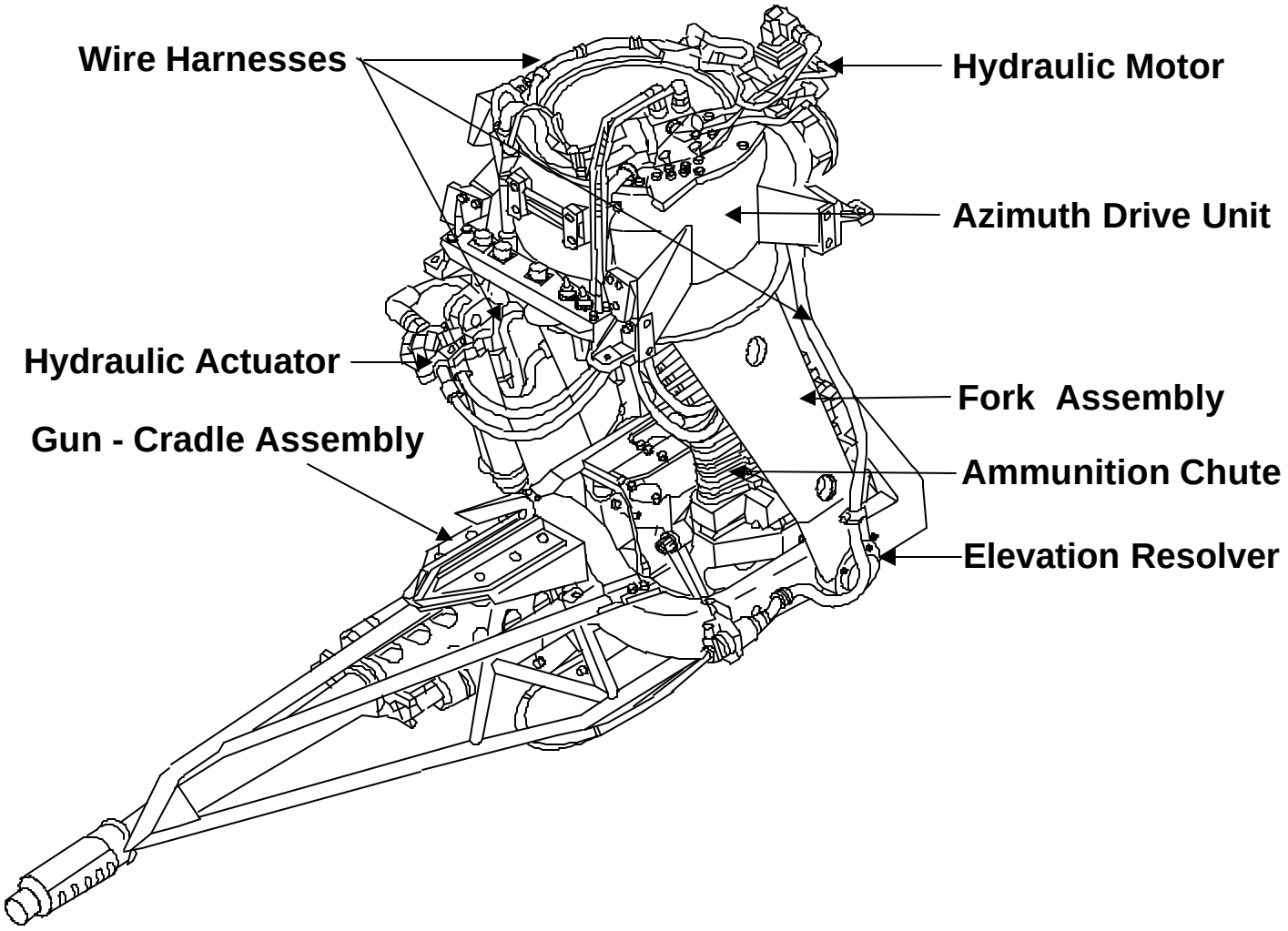
MRAWS Overview

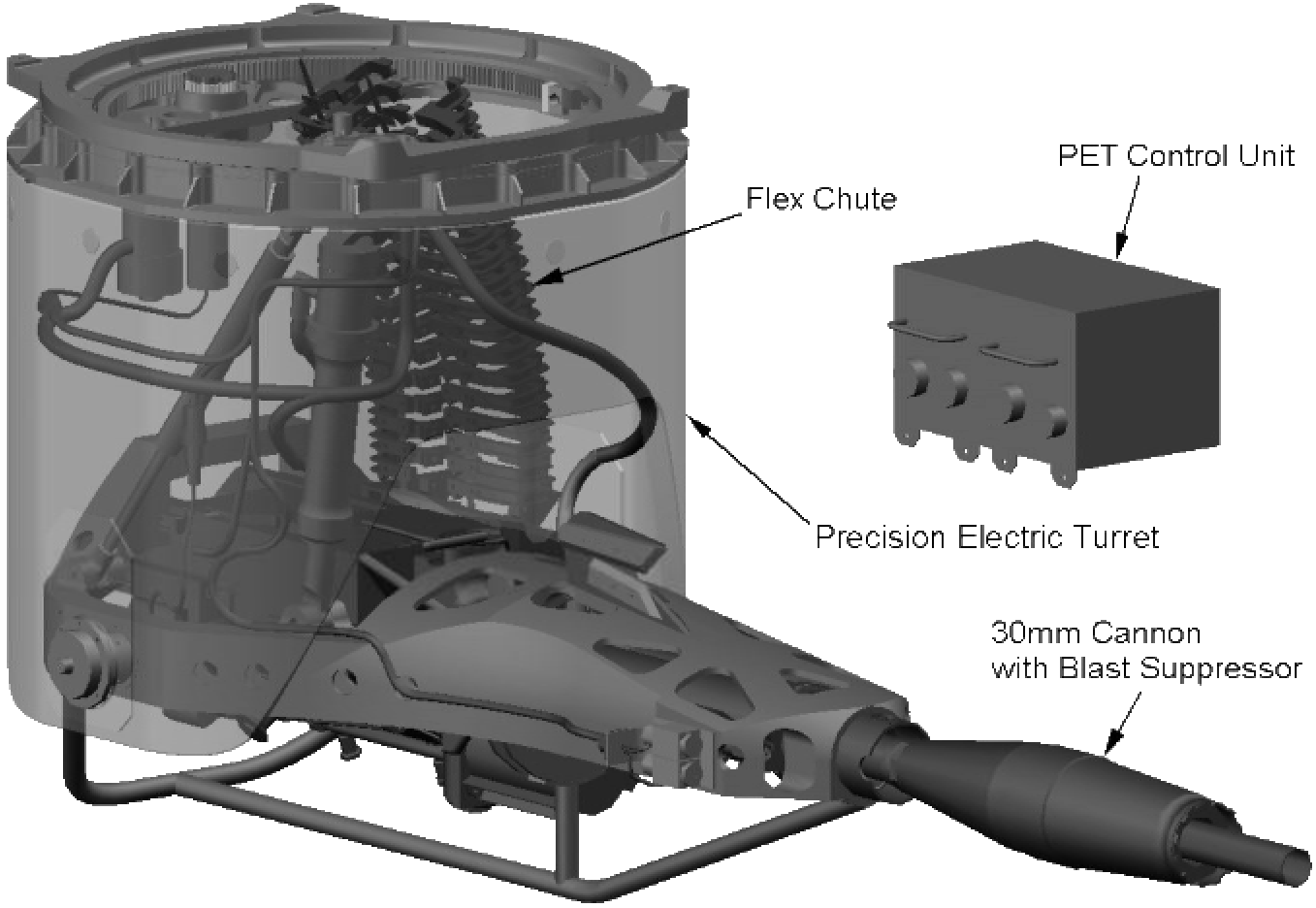
- **Phase 1 Analysis Effort**
  - **Assess the Accuracy and Lethality Impacts of the Advanced 30mm Combat Round (A30CR) and/or the Precision Electric Turret (PET)**
- **Specific Performance Goals evaluated were:**
  - **50% Improvement in Anti-Personnel Lethality**
  - **20% Improvement in ATA Performance**
  - **No Degradation Against Light Skinned Vehicles**
- **Customer, Contractor and Subcontractor Integrated Product Teams**
  - **Developed Technical Information and Performance Data.**

AH-64 Apache

Current Turret



Precision Electric Turret



Performance Assessment Method

- **Error Budgets Defined and Models Analyzed**
- **Ph of Current Turret and Ammunition (Baseline) Compared to A30CR, and PET + A30CR**
- **Defined Nominal Conditions and Assumptions**
- **Accounted for All Known Significant Error Sources**
- **Sensitivities were Obtained by Simulation Results, Analytical Derivations, or by Empirical Data**

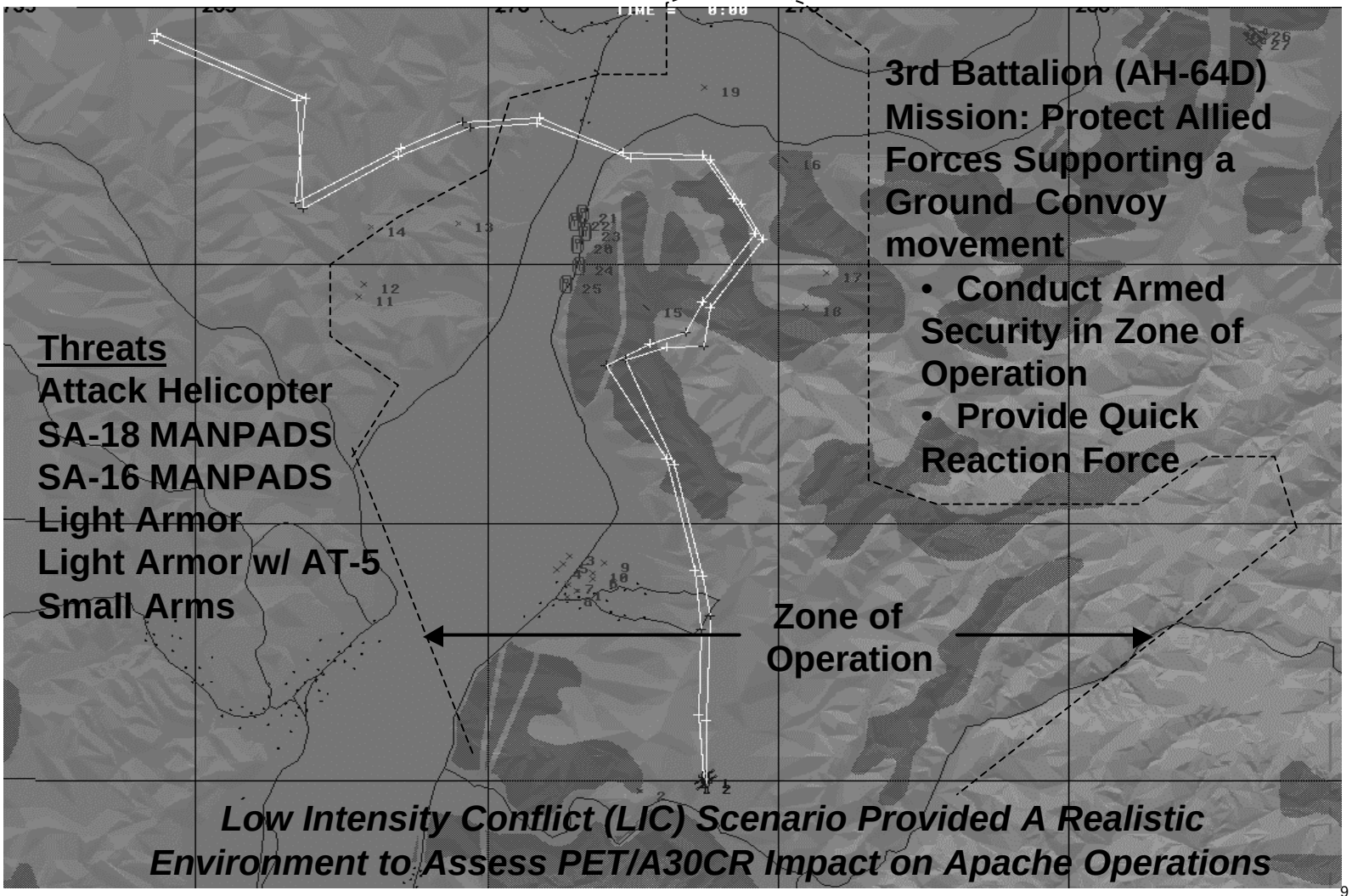
Probability of Hit Effects

- **PET**
  - **Ph Increased Considerably for Range of 1000 m**
  - **Ph Increased Slightly for Ranges of 2000 and 3000 m**
- **A30CR (Bursting Modes)**
  - **Ph Increased Considerably for All Ranges Evaluated**
- **PET + A30CR**
  - **Ph Improvements Not as Large as:**
    - **Improvements of A30CR over Baseline**
    - **Improvements of PET over Baseline**

Performance Analysis

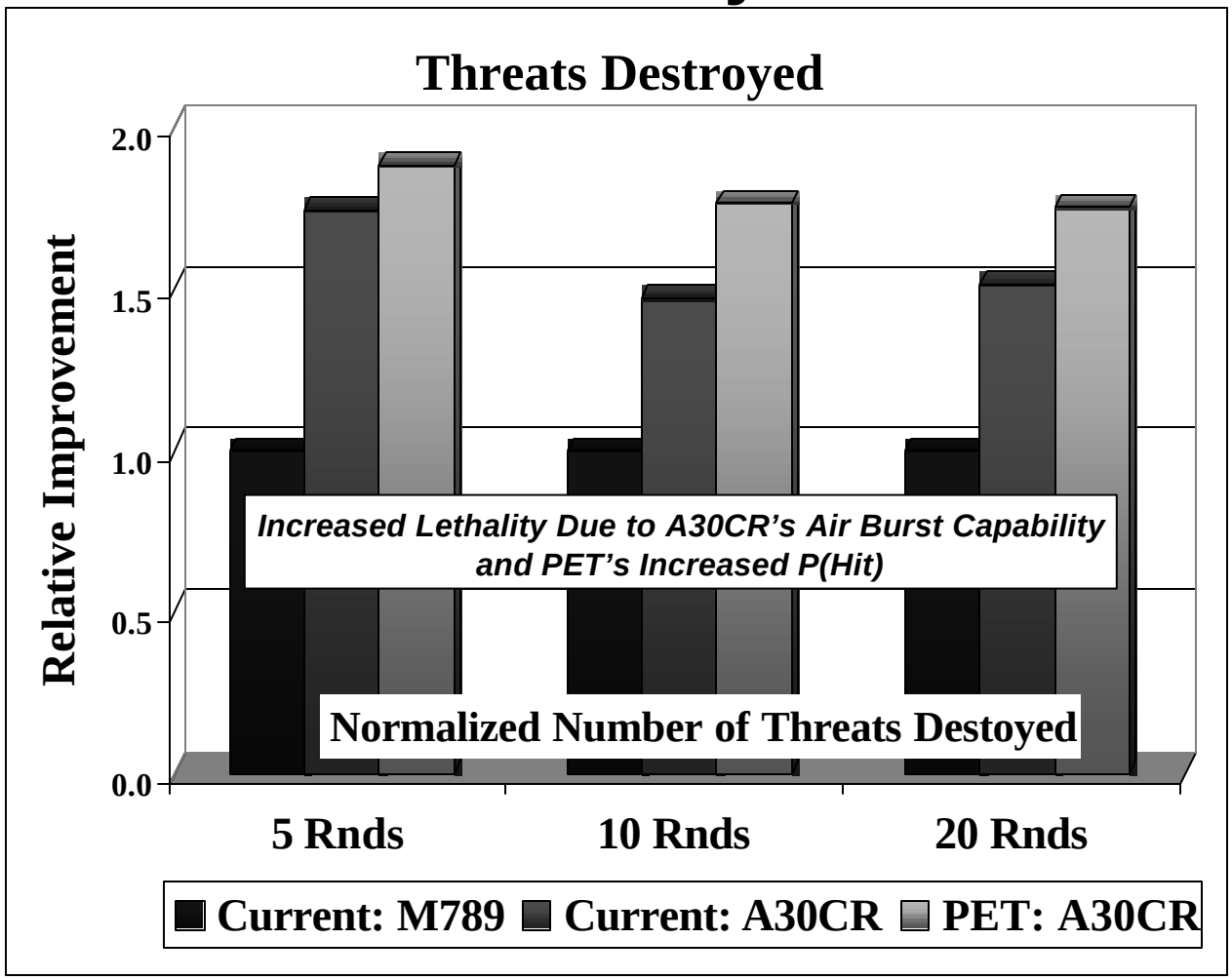
- **ATCOM Model Modified**
  - **Facilitate On-Line Effectiveness Analysis**
  - **Selected Cases Represent Realistic Mission Engagements**
- **Mission Begins in Zone of Operation**
  - **Low Intensity Conflict Mission**
  - **Provide Convoy Security**
  - **Use Gun System (Only) to Engage Enemy**
    - **Personnel**
    - **Light skinned vehicles**
    - **Helicopters**
- **Configurations were Assessed by Evaluating**
  - **Lethality**
  - **Kill Productivity**
  - **Survivability**
  - **Stowed Kills**

Modified ATCOM Model

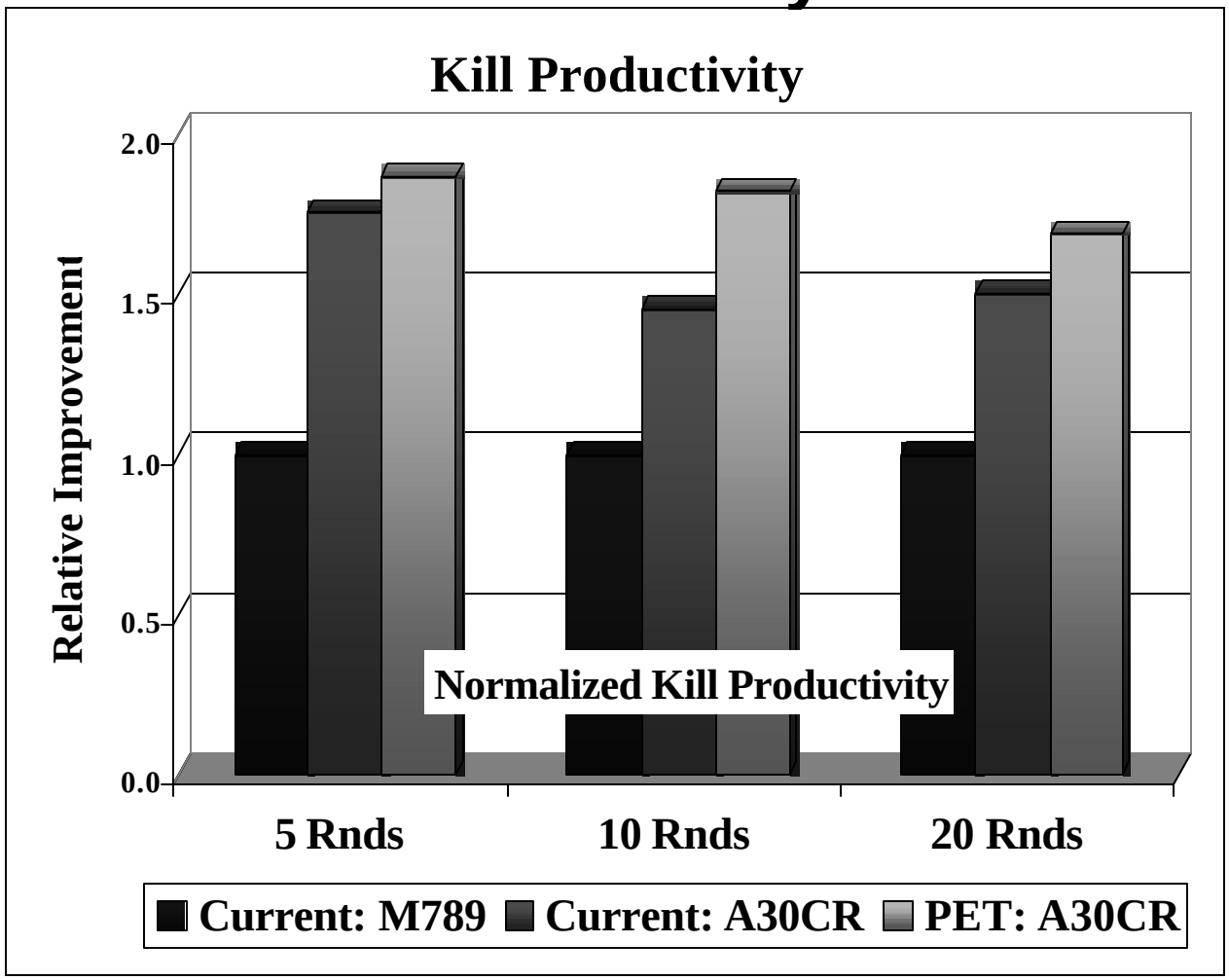


Low Intensity Conflict (LIC) Scenario Provided A Realistic Environment to Assess PET/A30CR Impact on Apache Operations

Lethality


Threats Destroyed
Relative Improvement
2.0
1.5
1.0
0.5
0.0
Increased Lethality Due to A30CR's Air Burst Capability and PET's Increased P(Hit)
Normalized Number of Threats Destoyed
5 Rnds
10 Rnds
20 Rnds
Current: M789
Current: A30CR
PET: A30CR

Lethality


Kill Productivity
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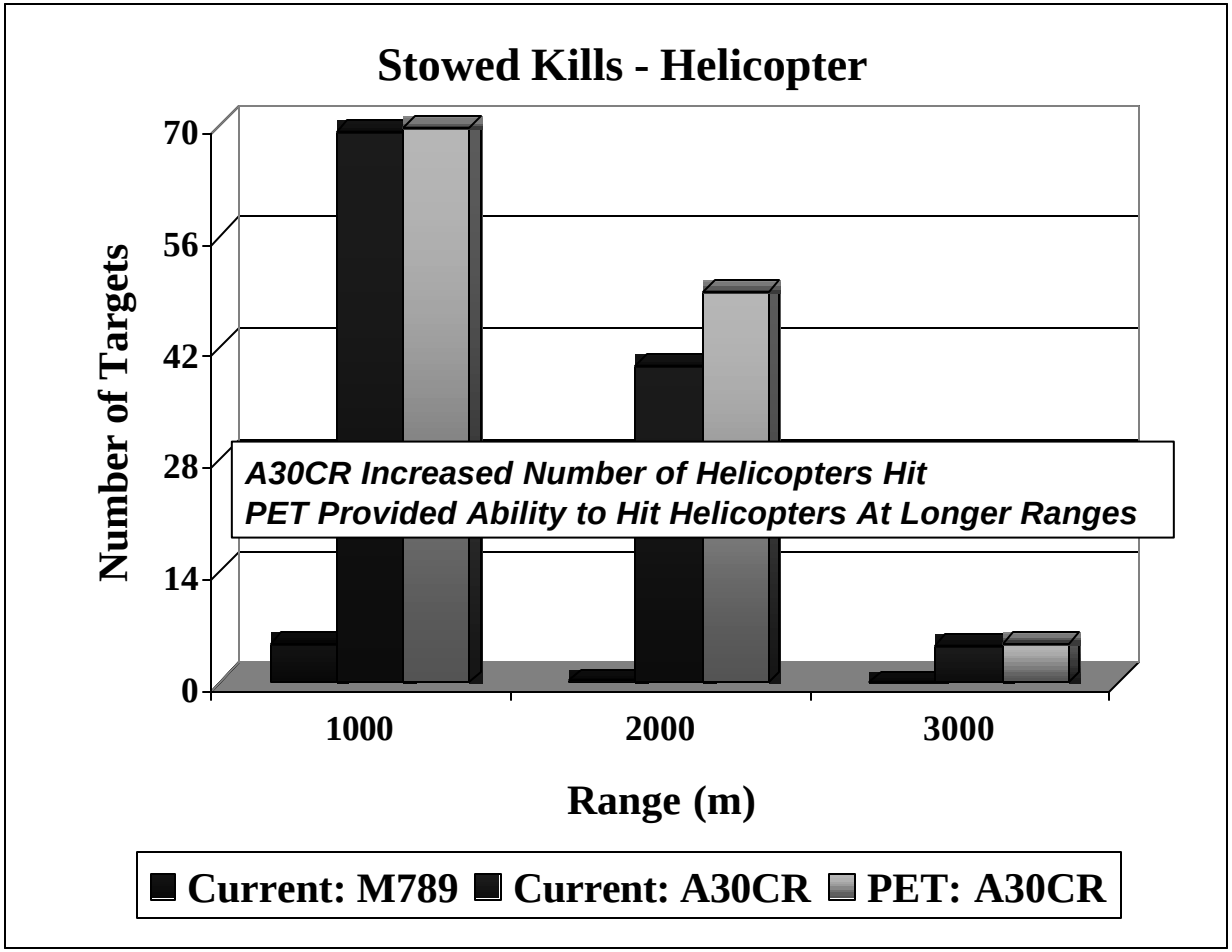
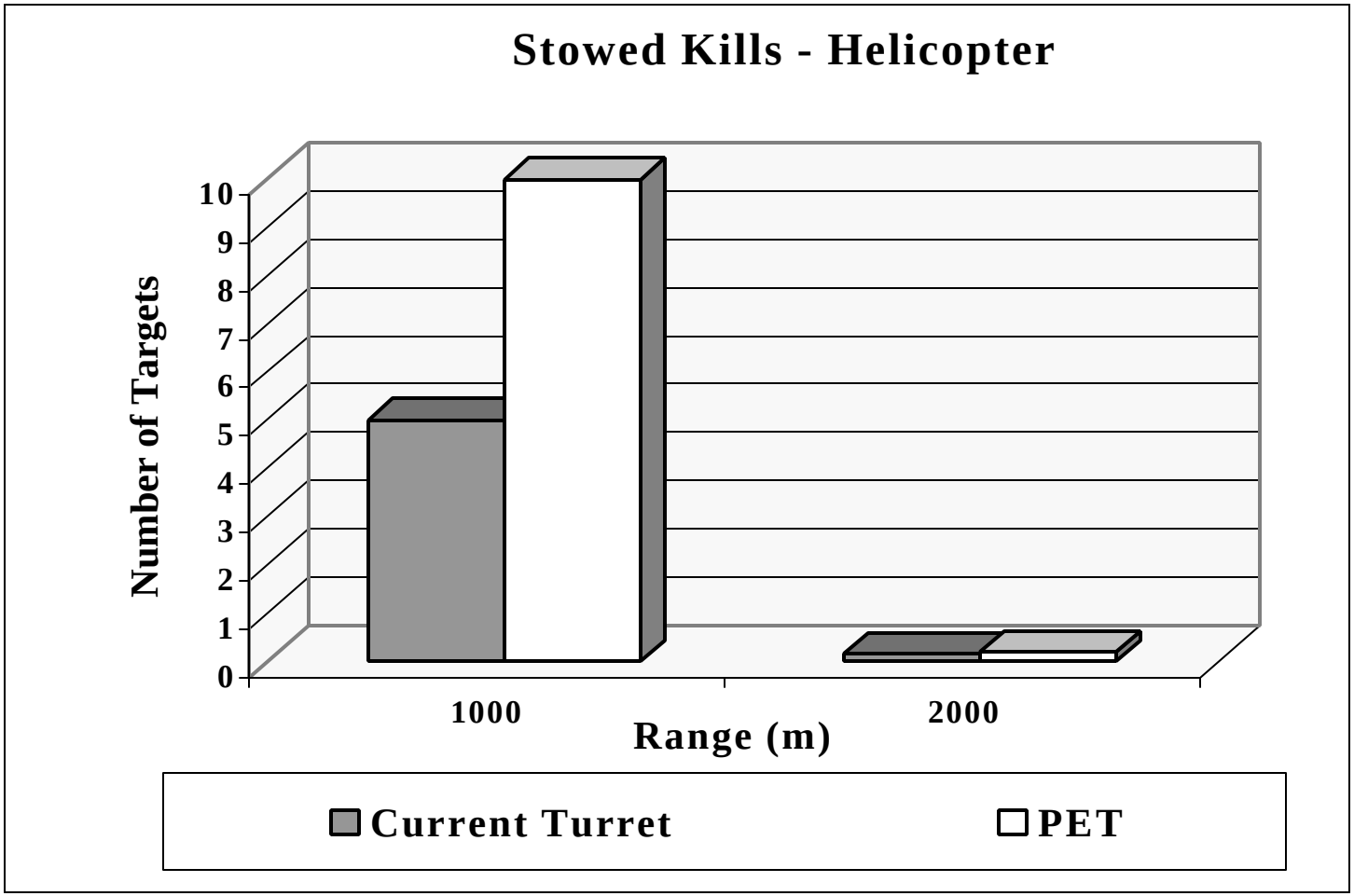
Normalized Kill Productivity
5 Rnds
10 Rnds
20 Rnds
Current: M789
Current: A30CR
PET: A30CR

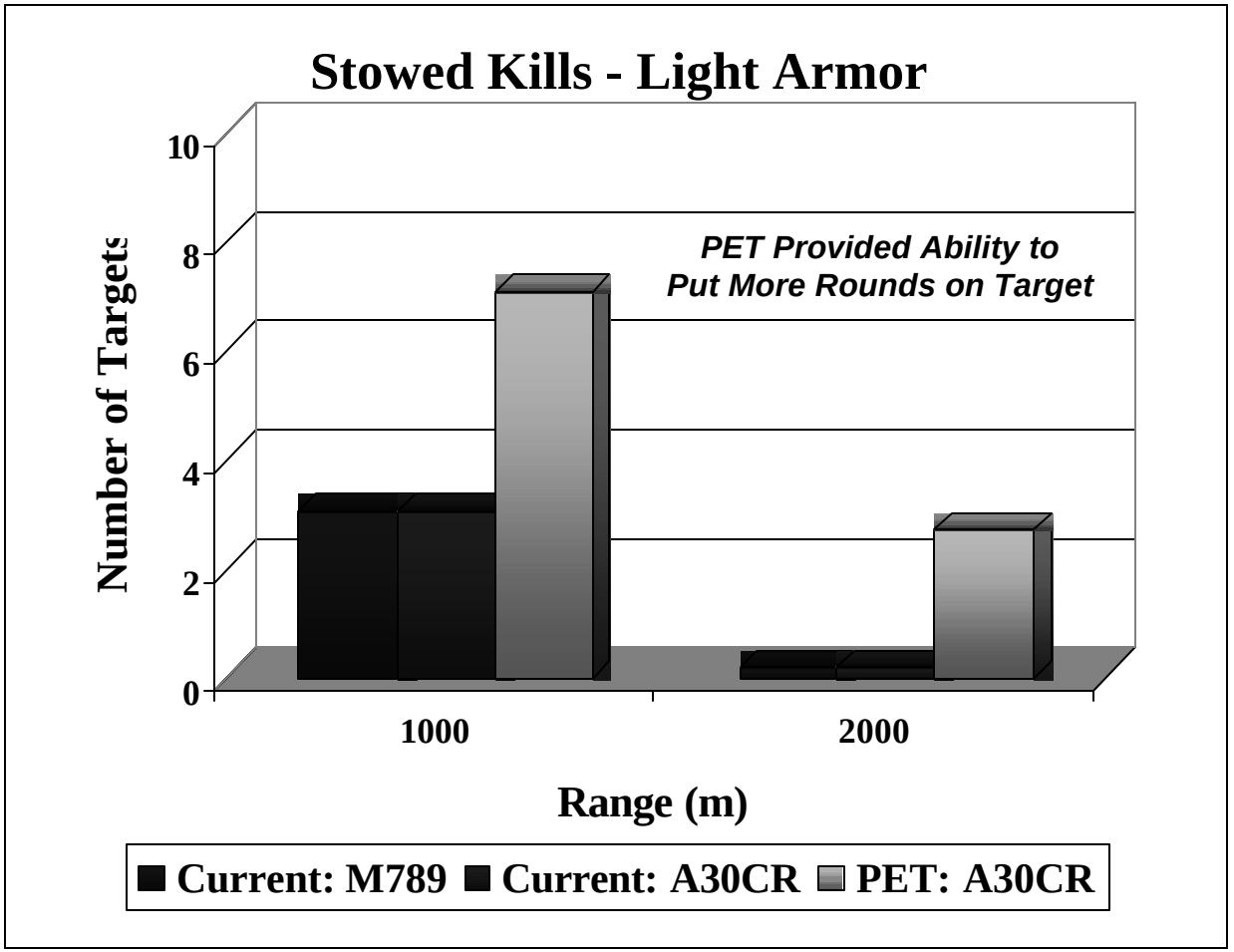
Stowed Kills



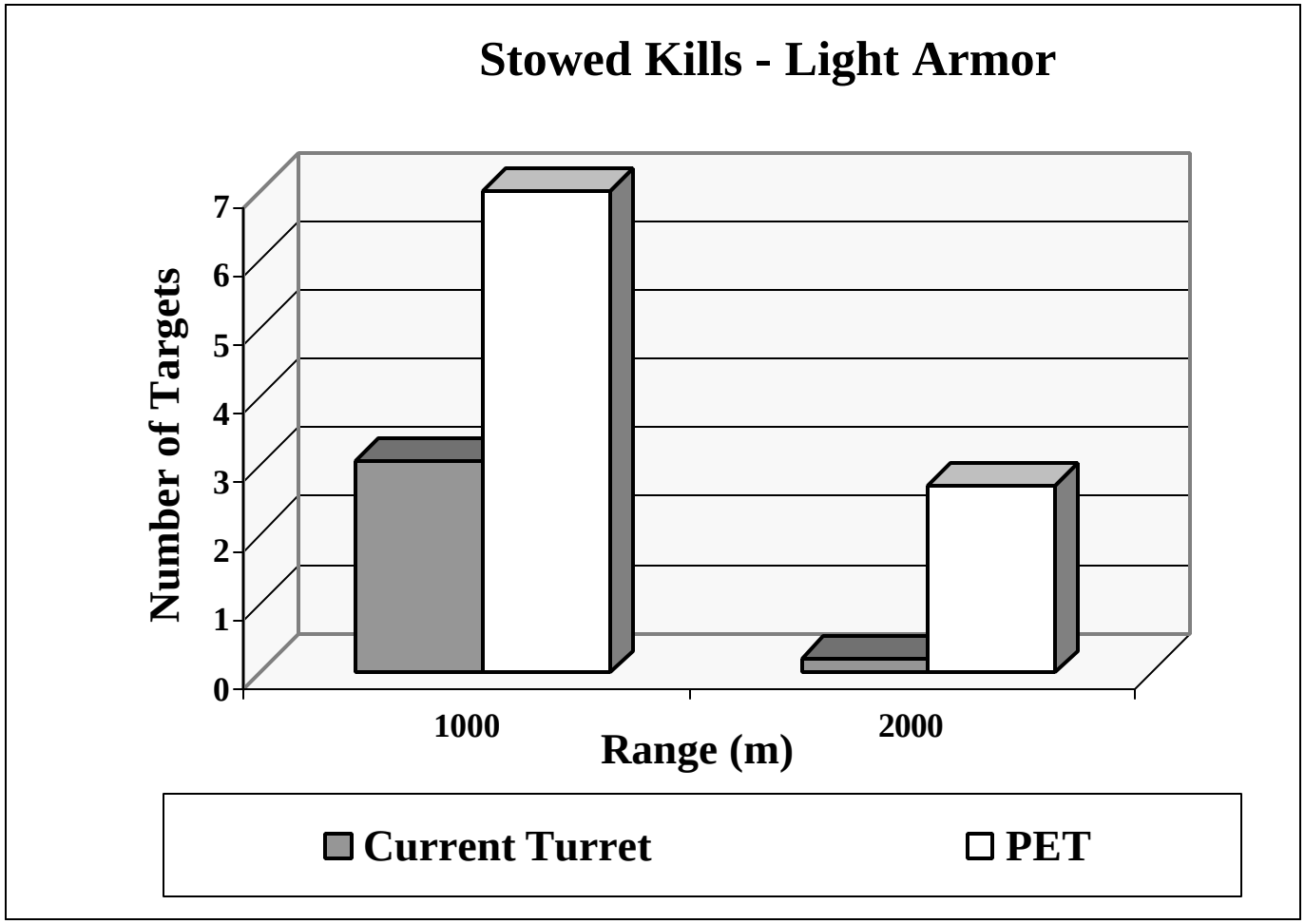
Stowed Kills - PET



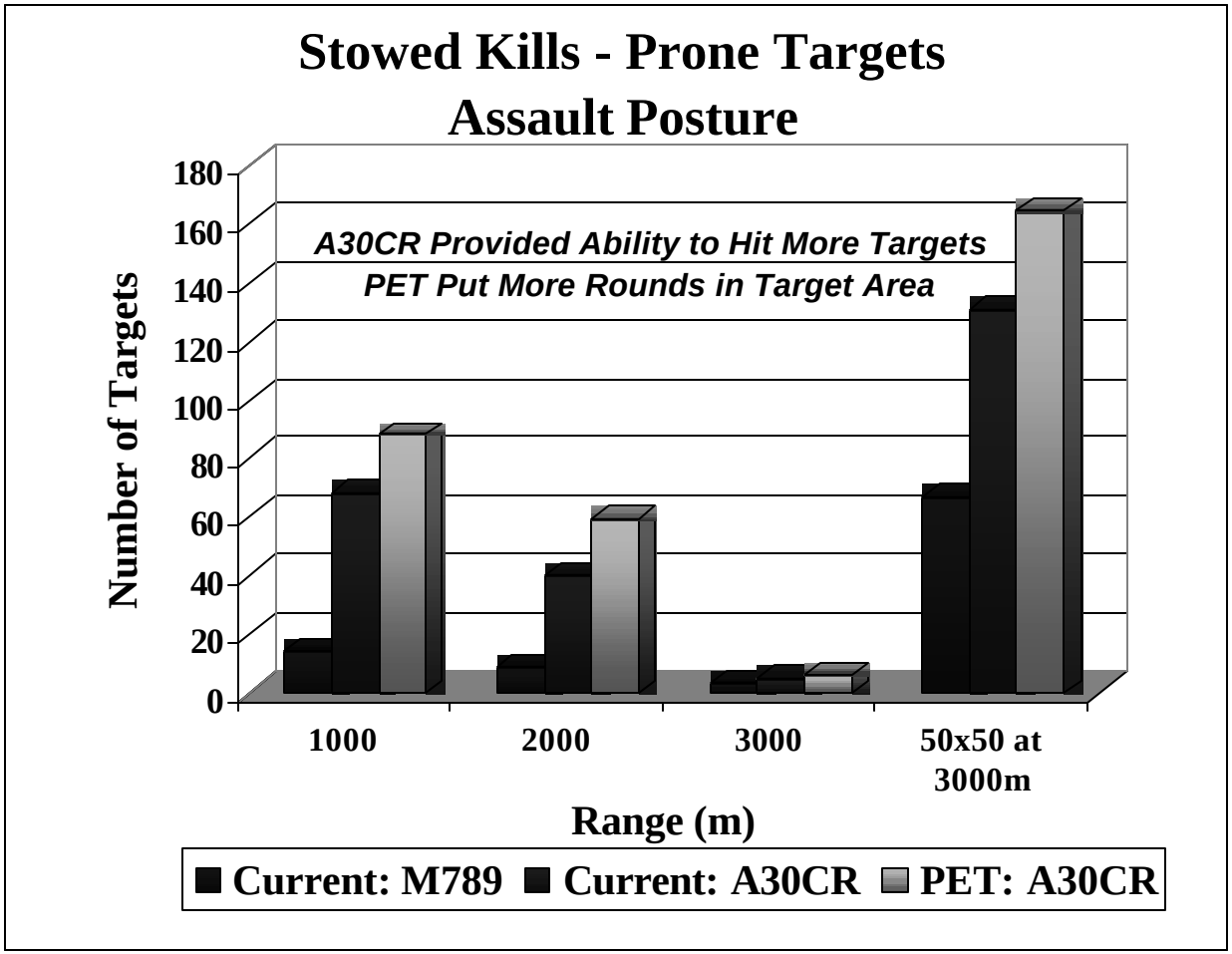
Stowed Kills



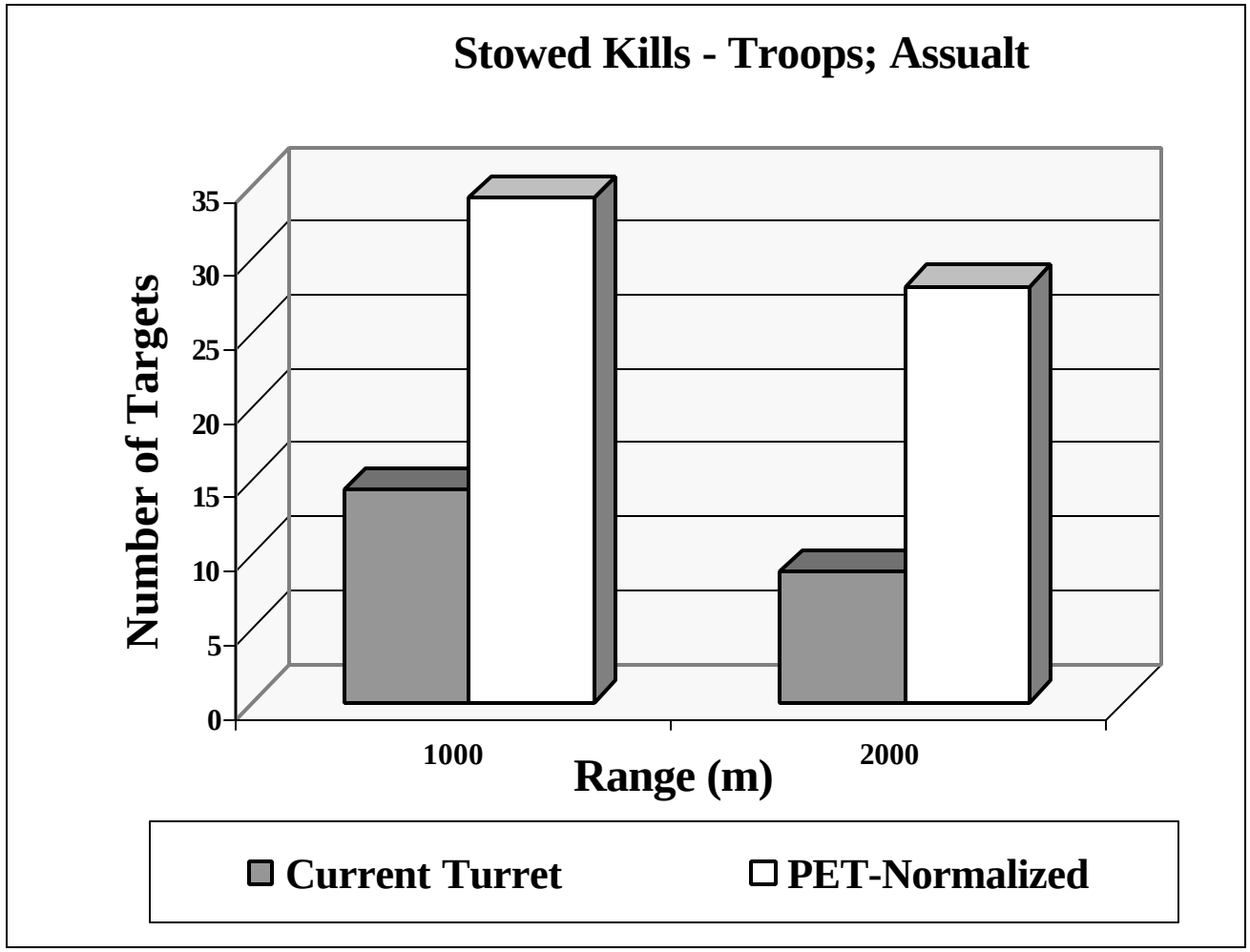
Stowed Kills - PET



Stowed Kills



Stowed Kills - PET



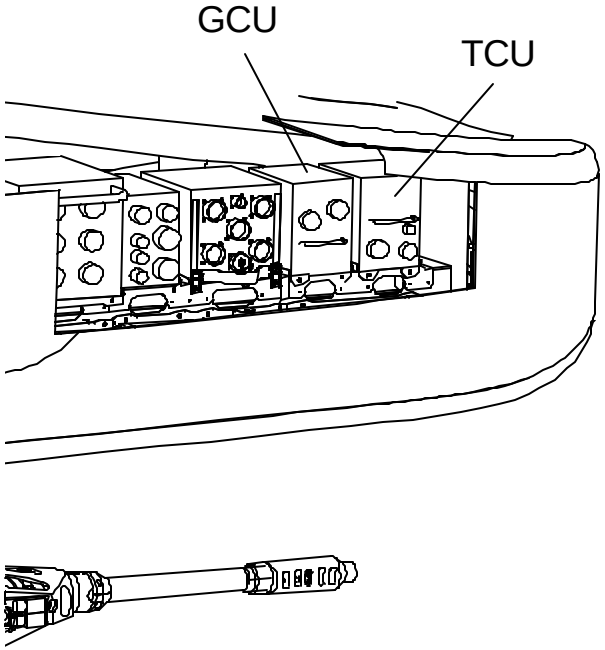
Performance Assessment

- **PET + A30CR Provides the Best Improvement @ All Ranges and Target Types**
  - **Independent Variables of Range (1000, 2000, and 3000 meters) and Burst Size (5, 10 and 20 rounds)**
- **PET Approximately Doubles Stowed Kills @ 1000 m**
  - **Helicopter, Light Armor, and Ground Troops**
- **PET @ 2000 m**
  - **Three Times as Effective Against Ground Troops**
  - **Ten Times as Effective Against Light Armor**

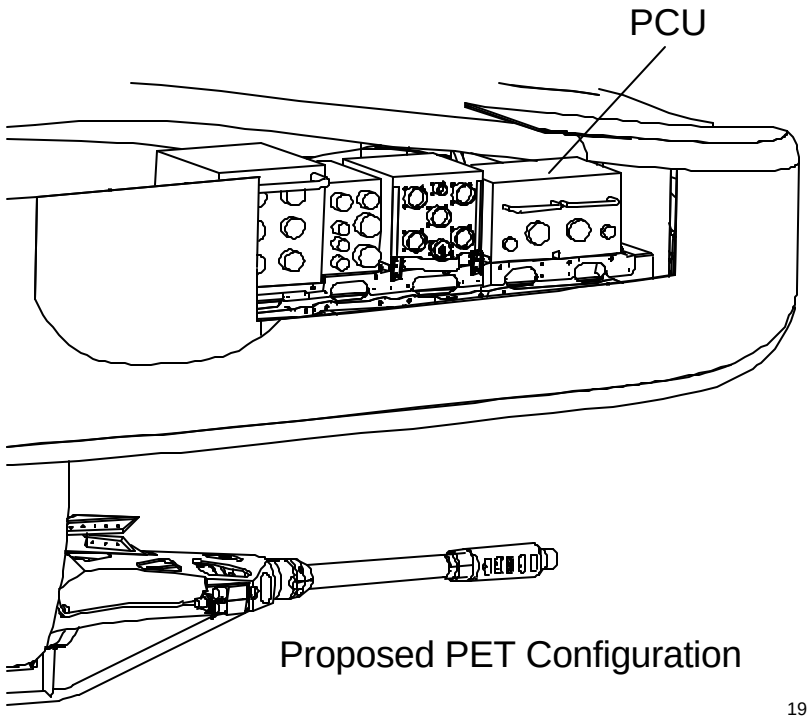
Benefit Assessment

+ PET Provides Cost-Effective Integration For A30CR

- **PET Control Unit (PCU) Incorporates Functions of Three Current Electrical Units**
- **Turret Control Unit (TCU), Gun Control Unit (GCU), and Train Rate Sensor; Inclusion of A30CR Capability is a Minimal Impact**



Current AH-64 Configuration



Proposed PET Configuration

Benefit Assessment

+ **Provides Substantial Weight Reduction; Over 33 lbs**
  - **18.0 Pound Lighter Turret Subsystem**
  - **8.3 Pounds of Aircraft Hydraulic Provisions Eliminated**
  - **7.0 Pounds of Aircraft-Discrete Signal Wires Eliminated**
+ **Provides Surplus Excess Hydraulic Capacity**
  - **4 Gallons per Minute of Hydraulic Capacity, Previously Allocated for Turret Azimuth and Elevation Drives**
– **Requires Additional Aircraft Electrical Power**
  + **Turret Drives; 115VAC, 3f input (25 amps) used to Provide 270VDC Bus for the Motor Drive Modules**
+ **Designed Reliability and Maintainability Reduces Operational and Support Costs**

Benefit Assessment

+ **Designed Reliability and Maintainability**
  - **One electronic box (latest technology PCU) vs. three (TCU, TRS, & GCU)**
  - **High-Reliability Electrical Drives**
  - **Self-Adjusting Drive Gears Accommodate Wear & Backlash**
  - **No Turret or Related Aircraft Hydraulic Components**
  - **PET Contains 50% Fewer Parts by Design Integration**
+ **Reduced Operational and Support Costs**
  - **Modular Design Allows for Easier Component Replacement**
  - **Three PET Components (PCU, AZ Drive, and EL Drive) Represent the Function of Components that Account for 85% of the Current Turret's Operational & Support Costs**

PET Performance & Benefit Assessment Summary

- **PET + A30CR Provides the Best Increase in Performance at All Ranges and Target Types; Meets or Exceed Goals**
- **PET Provides Impressive Performance Improvements**
  - **@ 1000 m: Doubles Stowed Kills for Ground Troops, Light Armor, and Helicopters**
  - **@ 2000 m: Triples Stowed Kills for Ground Troops; Ten Times More Stowed Kills for Light Armor**
- **PET Provides the Best Option for Minimizing A30CR Integration Impacts (Cost, Weight, R&M)**
- **PET Provides Substantial Weight Reduction; Improved Reliability and Maintainability; and Reduced O&S Costs**